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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN RE APPLICATION OF:	:
JOCHEN ACKERMAN, ET AL.	: EXAMINER: CHO, JENNIFER Y.
SERIAL NO.: 10/541,307	:
FILED: APRIL 10, 2006	: GROUP ART UNIT: 1621
FOR: IMPROVED PROCESS FOR CONTINUOUSLY PREPARING ALKY(METH)ACRYLATES WITH REPEATED CATALYST RECYCLING	:

APPEAL BRIEF

COMMISSIONER FOR PATENTS
ALEXANDRIA, VIRGINIA 22313

SIR:

Further to the July 24, 2008 Notice of Appeal, this is an Appeal from the April 24, 2008 Rejection.

I. REAL PARTY IN INTEREST

The real party in interest in this appeal is Evonik Roehm GmbH, Darmstadt, Germany.

II. RELATED APPEALS AND INTERFERENCES

Appellants, Appellants' legal representative and the assignee are aware of no appeals, interferences, or judicial proceedings which may be related to, directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

III. STATUS OF CLAIMS

Claims 1-22 are pending and stand rejected.

The rejections of claims 1-22 are being appealed.

IV. STATUS OF AMENDMENTS

No Amendment After Final Rejection was filed.

V. SUMMARY OF CLAIMED SUBJECT MATTER

Independent claim 1 is directed to a process for continuously preparing higher (meth)acrylic esters in a plant including a reaction apparatus and a vacuum evaporation stage for receiving a bottom product remaining after separation of a highly pure ester product. *See* present specification, page 12, lines 11 to 14, page 13, lines 20 to 24; claim 1. The process includes transesterifying methyl(meth)acrylate with a higher alcohol in the presence of a catalyst or catalyst mixture in the reaction apparatus, dividing a bottom effluent from the vacuum evaporation stage into a first portion and a second portion, and recycling the first

portion to the reaction apparatus. *See* present specification, page 13, lines 20 to 38; claim 1. In the process, dividing the bottom effluent from the vacuum evaporation stage includes selecting a proportion of the bottom effluent that will constitute the first portion based on current catalyst activity. *See* present specification, page 13, lines 7 to 11; claim 1. Claims 4-9 depend directly or indirectly from claim 1. *See* claims 4-9.

Independent claim 2 is directed to a process for continuously preparing higher (meth)acrylic esters in a plant including a reaction apparatus and a film evaporator for separating a highly pure ester product. *See* present specification, page 12, lines 11 to 14, page 14, lines 3 to 9; claim 2. The process includes transesterifying methyl(meth)acrylate with a higher alcohol in the presence of a catalyst or catalyst mixture in the reaction apparatus, dividing a bottom effluent from the film evaporator into a first portion and a second portion, and recycling the first portion to the reaction apparatus. *See* present specification, page 14, lines 3 to 30; claim 2. In the process, dividing the bottom effluent from the film evaporator includes selecting a proportion of the bottom effluent that will constitute the first portion based on current catalyst activity. *See* present specification, page 13, lines 7 to 11; claim 2. Claims 10-12, 16 and 18 depend directly or indirectly from claim 2. *See* claims 10-12, 16 and 18.

Independent claim 3 is directed to a process for continuously preparing higher (meth)acrylic esters in a plant including a reaction apparatus, a film evaporator for separating a highly pure ester product, and a vacuum evaporation stage for receiving a bottom product remaining after separation of a highly pure ester product. *See* present specification, page 12, lines 11 to 14, page 14, line 34 to page 15, line 6; claim 3. The process includes transesterifying methyl(meth)acrylate with a higher alcohol in the presence of a catalyst or

catalyst mixture in the reaction apparatus, dividing a bottom effluent from the film evaporator into a first portion and a second portion, recycling the first portion to the reaction apparatus, dividing a bottom effluent of the vacuum evaporation stage into a third portion and a fourth portion, and recycling the third portion to the reaction apparatus. *See* present specification, page 14, line 34 to page 15, line 24; claim 3. In the process, dividing the bottom effluent from the film evaporator includes selecting a proportion of the bottom effluent from the film evaporator that will constitute the first portion based on current catalyst activity, and dividing the bottom effluent from the vacuum evaporation stage includes selecting a proportion of the bottom effluent from the vacuum evaporation stage that will constitute the third portion based on current catalyst activity. *See* present specification, page 13, lines 7 to 11; claim 3. Claims 13-15, 17 and 19 depend directly or indirectly from claim 3. *See* claims 13-15, 17 and 19.

Independent claim 20 is directed to a process for continuously preparing higher (meth)acrylic esters in a plant including a reaction apparatus and a vacuum evaporation stage for receiving a bottom product remaining after separation of a highly pure ester product. *See* present specification, page 12, lines 11 to 14, page 13, lines 20 to 24; claim 1. The process includes transesterifying methyl(meth)acrylate with a higher alcohol in the presence of a catalyst or catalyst mixture in the reaction apparatus, dividing a bottom effluent from the vacuum evaporation stage into a first portion and a second portion, and recycling the first portion to the reaction apparatus. *See* present specification, page 13, lines 20 to 38; claim 20. In the process, the first portion is recycled directly to the reaction apparatus. *See* present specification, FIG. 2; claim 20.

Independent claim 21 is directed to a process for continuously preparing higher (meth)acrylic esters in a plant including a reaction apparatus and a film evaporator for

separating a highly pure ester product. *See* present specification, page 12, lines 11 to 14, page 14, lines 3 to 9; claim 21. The process includes transesterifying methyl(meth)acrylate with a higher alcohol in the presence of a catalyst or catalyst mixture in the reaction apparatus, dividing a bottom effluent from the film evaporator into a first portion and a second portion, and recycling the first portion to the reaction apparatus. *See* present specification, page 14, lines 3 to 30; claim 21. In the process, the first portion is recycled directly to the reaction apparatus. *See* present specification, FIG. 3; claim 21.

Independent claim 22 is directed to a process for continuously preparing higher (meth)acrylic esters in a plant including a reaction apparatus, a film evaporator for separating a highly pure ester product, and a vacuum evaporation stage for receiving a bottom product remaining after separation of a highly pure ester product. *See* present specification, page 12, lines 11 to 14, page 14, line 34 to page 15, line 6; claim 22. The process includes transesterifying methyl(meth)acrylate with a higher alcohol in the presence of a catalyst or catalyst mixture in the reaction apparatus, dividing a bottom effluent from the film evaporator into a first portion and a second portion, recycling the first portion to the reaction apparatus, dividing a bottom effluent of the vacuum evaporation stage into a third portion and a fourth portion, and recycling the third portion to the reaction apparatus. *See* present specification, page 14, line 34 to page 15, line 24; claim 22. In the process, the first portion is recycled directly to the reaction apparatus, and the third portion is recycled directly to the reaction apparatus. *See* present specification, FIG. 4; claim 22.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

A. Rejection Under 35 U.S.C. §112, First Paragraph

Claims 1-3, 7-15 and 20-22 are rejected under the written description requirement of 35 U.S.C. §112, first paragraph.

B. Rejection Under 35 U.S.C. §112, Second Paragraph

Claims 1-22 are rejected as indefinite under 35 U.S.C. §112, second paragraph.

C. Rejection Under 35 U.S.C. §103

Claims 1-22 are rejected under 35 U.S.C. §103(a) over U.S. Patent Application Publication No. US 2004/0171868 to Geisendoerfer et al. ("Geisendoerfer").

VII. ARGUMENT

Appellants submit that the outstanding rejections should be reversed for the following reasons.

A. Rejection Under 35 U.S.C. §112, First Paragraph

As indicated above, claims 1-3, 7-15 and 20-22 are rejected under the written description requirement of 35 U.S.C. §112, first paragraph. Appellants respectfully request reversal of the rejection.

The Examiner asserts that the present specification does not provide support for "selecting a proportion of the bottom effluent from the film evaporator ... based on current

catalyst activity," as recited in claims 1-3. *See* April 24, 2008 Office Action, pages 2 to 3. The present specification explicitly discloses that "[t]he amount of catalyst which is recycled is controlled with the aid of alcohol (B) or MMA (A) conversion in the reaction apparatus (1) as a measure of the current catalyst activity. A further indicator which can be used for the current catalyst activity is the amount and composition of the low boiler cycle stream (14)." *See* present specification, page 13, lines 8 to 13. The foregoing passage from the present specification provides ample and complete support for the language in claims 1-3.

The Examiner asserts that the present specification does not provide support for the recitation that a "portion [of the bottom effluent] is recycled directly to the reaction apparatus," as recited in claims 20-22. *See* April 24, 2008 Office Action, pages 3 to 4. FIGS. 2 to 4 of the present specification plainly show a recycled stream 18 that is returned directly from the film evaporator 5 or the vacuum evaporation stage 6 to the reaction apparatus 1 – that is, there are no apparatus components (or associated processing) between the film evaporator 5 or the vacuum evaporation stage 6 and the reaction apparatus 1. *See* present specification; FIGS. 2 to 4. The features shown in FIGS. 2 to 4 and described in the present specification at pages 13 to 15, provide ample and complete support for the language in claims 20-22.

The Examiner asserts that the present specification fails to support the recitation of the "first portion", "second portion," etc., in the present claims. *See* April 24, 2008 Office Action, page 4. Appellants submit that these references were added to the claims to improve their clarity and are fully supported by the present specification. In the present claims, the bottom effluent of various apparatus are divided into different parts that are then conveyed to different locations. This aspect of the present invention is described throughout the original

specification and claims as filed. *See, e.g.,* present specification, FIGS. 2-4. The assignment of the descriptors "first," "second," etc., to "portions" of the bottom effluent permits the separated parts to be identified with clarity when they appear later in a claim or in a dependent claim (so that there is no confusion about which "portion" is being discussed when the part is mentioned again later in the claims). The reference to the "first portion", "second portion," etc., does not introduce any new subject matter to the present application, but rather permits description of what is already present in the application with greater clarity. While the term "first portion," "second portion," etc., do not literally appear in the present specification, Appellants note that such literal support is not required. *See, e.g.,* MPEP §2163.

Claims 7-15 are rejected solely for their dependency from claims 1-3.

For the foregoing reasons, claims 1-3, 7-15 and 20-22 fully supported by the present specification. Accordingly, reversal of the rejection is respectfully requested.

B. Rejection Under 35 U.S.C. §112, Second Paragraph

As indicated above, claims 1-22 are rejected as indefinite under 35 U.S.C. §112, second paragraph. Appellants respectfully request reversal of the rejection.

The Examiner asserts that that the term "current catalyst activity" in claims 1-3 is indefinite. *See* April 24, 2008 Office Action, page 5. One of ordinary skill in the art would readily appreciate the meaning of "current catalyst activity." As is plain, e.g., from the Examples of the present specification (see pages 15 to 24), the very purpose of the processes of claims 1-3 is to obtain a high yield of an alkyl(meth)acrylate using a little catalyst as possible. A catalyst's activity is its ability to facilitate a high yield of the desired product

(alkyl(meth)acrylate) – current catalyst activity can be determined, e.g., by measuring alcohol or MMA conversion (*see* present specification, page 13, lines 8 to 11). If current catalyst activity is low, yield of alkyl(meth)acrylate is low. Appellants discovered, *inter alia*, that by recycling a catalyst in a particular manner it is possible to maintain high catalyst activity while using less catalyst. *See* present specification, page 24, lines 21 to 22. According to claims 1-3, the amount of bottom effluent (which includes used catalyst) that is returned to the reaction apparatus is determined based on current catalyst activity. For example, if the yield of alkyl(meth)acrylate is high, a greater amount of catalyst could be recycled, while if the yield of alkyl(meth)acrylate is low, a smaller amount of catalyst could be recycled. The meaning of the term "current catalyst activity" is well within the grasp of one of ordinary skill in the art.

The Examiner asserts that the present claims are indefinite because the claims do not explicitly indicate what happens to the "second portion" and the "fourth portion" of bottom effluent recited in the claims. *See* April 24, 2008 Office Action, page 5. The present claims make clear that the "first portion" and the "third portion" of the bottom effluent are recycled. Appellants have decided not to limit their claims to require that any particular action be taken with respect to the "second portion" and the "fourth portion" of the bottom effluent. The present specification describes embodiments in which streams corresponding to the "second portion" and the "fourth portion" are discharged. *See, e.g.,* present specification, FIGS. 2-4. However, the claims are not so limited, and need not be so limited. The Examiner appears to object not to the clarity of the claims, but rather to their breadth. As is well settled, breadth of a claim is not to be equated with indefiniteness. *See* MPEP §2173.04 (citing *In re Miller*, 169 U.S.P.Q. 597 (C.C.P.A. 1971)).

Claims 7-19 are rejected solely for their dependency from claims 1-3.

Claims 1-22 are definite. Accordingly, reversal of the rejection is respectfully requested.

C. Rejection Under 35 U.S.C. §103

As indicated above, claims 1-22 are rejected under 35 U.S.C. §103(a) over U.S. Patent Application Publication No. US 2004/0171868 to Geisendoerfer et al. ("Geisendoerfer"). Appellants respectfully request reversal of the rejection.

i. Claims 1-3

Claim 1 recites "[a] process ... comprising: transesterifying methyl(meth)acrylate (A) with a higher alcohol (B) in the presence of a catalyst or catalyst mixture in the reaction apparatus; dividing a bottom effluent from the vacuum evaporation stage into a first portion and a second portion; and recycling the first portion to the reaction apparatus; wherein dividing the bottom effluent from the vacuum evaporation stage comprises selecting a proportion of the bottom effluent that will constitute the first portion based on current catalyst activity" (emphasis added). Claim 2 recites "...dividing a bottom effluent from the film evaporator into a first portion and a second portion ... wherein dividing the bottom effluent from the film evaporator comprises selecting a proportion of the bottom effluent that will constitute the first portion based on current catalyst activity" (emphasis added). Claim 3 recites "...dividing a bottom effluent from the film evaporator into a first portion and a second portion ... dividing a bottom effluent of the vacuum evaporation stage into a third portion and a fourth portion ... wherein: dividing the bottom effluent from the film

evaporator comprises selecting a proportion of the bottom effluent from the film evaporator that will constitute the first portion based on current catalyst activity; and dividing the bottom effluent from the vacuum evaporation stage comprises selecting a proportion of the bottom effluent from the vacuum evaporation stage that will constitute the third portion based on current catalyst activity" (emphasis added). Geisendoerfer does not disclose or suggest such processes.

As indicated above, each of claims 1-3 requires that a portion of a bottom effluent from a film evaporator and/or a vacuum evaporation stage is recycled to a reaction apparatus is selected on the basis of current catalyst activity. The Examiner asserts that Geisendoerfer "teaches that there are advantages to interchanging and combining these steps based on exposure of the catalyst and so that catalyst-induced secondary or subsequent reactions are reduced ... [and] envisions a link to the process steps and catalytic activity." *See* April 24, 2008 Office Action, page 7. Regardless of whether Geisendoerfer "envisions a link" between the recited process steps and catalytic activity, there is absolutely disclosure or suggestion in Geisendoerfer of selecting an amount of catalyst that is to be recycled on the basis of catalytic activity. The mere suggestion of interchanging and combining steps in Geisendoerfer would not have led a skilled artisan to manipulate an amount of recycled catalyst on the basis of current catalyst activity. Absent disclosure or suggestion of selecting an amount of catalyst that is to be recycled on the basis of catalytic activity, Geisendoerfer would not have rendered obvious claims 1-3.

Accordingly, claims 1-3 distinguish over Geisendoerfer.

ii. Claims 20-22

Claim 20 recites "[a] process for continuously preparing higher (meth)acrylic esters (C) in a plant comprising a reaction apparatus and a vacuum evaporation stage for receiving a bottom product remaining after separation of a highly pure ester product, the process comprising ... dividing a bottom effluent from the vacuum evaporation stage into a first portion and a second portion; and recycling the first portion to the reaction apparatus; wherein the first portion is recycled directly to the reaction apparatus" (emphasis added). Claim 21 recites "... dividing a bottom effluent from the film evaporator into a first portion and a second portion; and recycling the first portion to the reaction apparatus; wherein the first portion is recycled directly to the reaction apparatus" (emphasis added). Claim 22 recites "... dividing a bottom effluent from the film evaporator into a first portion and a second portion; recycling the first portion to the reaction apparatus; dividing a bottom effluent of the vacuum evaporation stage into a third portion and a fourth portion; and recycling the third portion to the reaction apparatus; wherein: the first portion is recycled directly to the reaction apparatus; and the third portion is recycled directly to the reaction apparatus" (emphasis added). Geisendoerfer does not disclose or suggest such processes.

In claims 20-22, a portion of the bottom effluent from the film evaporator and/or the vacuum evaporation stage is recycled directly to the reaction apparatus. As recited in claims 20-22, the film evaporator separates a highly pure ester product and the vacuum evaporation stage receives a bottom product remaining after separation of a highly pure ester product. The Examiner asserts that Geisendoerfer discloses, in paragraph [170], that a bottom mixture is recycled to the transesterification reaction apparatus. *See* April 24, 2008 Office Action, page 7. However, Geisendoerfer discloses that the bottom products from analogous features

to those recited in claims 20-22 are not recycled to a reaction apparatus, but rather subjected to a residue work-up. *See, e.g.,* Geisendoerfer, paragraphs [0192] to [0201].

Accordingly, claims 20-22 distinguish over Geisendoerfer.

* * * *

As discussed in the present specification, this sequence of method steps in Geisendoerfer presents serious drawbacks. *See* present specification, page 10, line 24 to page 12, line 7. For example, the catalyst to be recycled in Geisendoerfer is subjected to thermal stresses that are not present in the processes of claims 20-22. As a result, the catalyst in Geisendoerfer may be recycled in an inactive form, which leads to a loss in product yield. Also, Geisendoerfer employs superfluous effort in the disclosed process to separate polymerization inhibitors and by-products, such as high boiling by-products, significantly further increasing production costs.

Claim 1-3 and 20-22 would not have been rendered obvious by Geisendoerfer. Claims 4-19 depend from claims 1-3 and, thus, also would not have been rendered obvious by Geisendoerfer. Accordingly, reversal of the rejection is respectfully requested.

VIII. CONCLUSION

For the above reasons, it is respectfully requested that all outstanding rejections of the pending claims be REVERSED.

Respectfully submitted,

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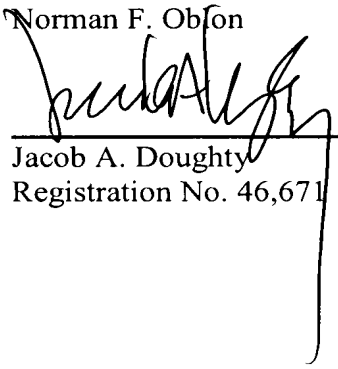

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CLAIMS APPENDIX

Claim 1 (Previously Presented): A process for continuously preparing higher (meth)acrylic esters (C) in a plant comprising a reaction apparatus and a vacuum evaporation stage for receiving a bottom product remaining after separation of a highly pure ester product, the process comprising:

transesterifying methyl(meth)acrylate (A) with a higher alcohol (B) in the presence of a catalyst or catalyst mixture in the reaction apparatus;

dividing a bottom effluent from the vacuum evaporation stage into a first portion and a second portion; and

recycling the first portion to the reaction apparatus;

wherein dividing the bottom effluent from the vacuum evaporation stage comprises selecting a proportion of the bottom effluent that will constitute the first portion based on current catalyst activity.

Claim 2 (Previously Presented): A process for continuously preparing higher (meth)acrylic esters (C) in a plant comprising a reaction apparatus and a film evaporator for separating a highly pure ester product, the process comprising:

transesterifying methyl(meth)acrylate (A) with a higher alcohol (B) in the presence of a catalyst or catalyst mixture in the reaction apparatus;

dividing a bottom effluent from the film evaporator into a first portion and a second portion; and

recycling the first portion to the reaction apparatus;

wherein dividing the bottom effluent from the film evaporator comprises selecting a proportion of the bottom effluent that will constitute the first portion based on current catalyst activity.

Claim 3 (Previously Presented): A process for continuously preparing higher (meth)acrylic esters (C) in a plant comprising a reaction apparatus, a film evaporator for separating a highly pure ester product, and a vacuum evaporation stage for receiving a bottom product remaining after separation of a highly pure ester product, the process comprising:

transesterifying methyl(meth)acrylate (A) with a higher alcohol (B) in the presence of a catalyst or catalyst mixture in the reaction apparatus;

dividing a bottom effluent from the film evaporator into a first portion and a second portion;

recycling the first portion to the reaction apparatus;

dividing a bottom effluent of the vacuum evaporation stage into a third portion and a fourth portion; and

recycling the third portion to the reaction apparatus;

wherein:

dividing the bottom effluent from the film evaporator comprises selecting a proportion of the bottom effluent from the film evaporator that will constitute the first portion based on current catalyst activity; and

dividing the bottom effluent from the vacuum evaporation stage comprises selecting a proportion of the bottom effluent from the vacuum evaporation stage that will constitute the third portion based on current catalyst activity.

Claim 4 (Previously Presented): The process of claim 1, wherein the higher alcohol comprises at least one member selected from the group consisting of n-butanol, isobutanol, and 2-ethylhexanol.

Claim 5 (Previously Presented): The process of claim 1, wherein the catalyst used comprises a homogeneous catalyst.

Claim 6 (Previously Presented): The process according to claim 5, wherein the catalyst comprises a titanate of the higher alcohol (B).

Claim 7 (Previously Presented): The process according to claim 1, wherein the first portion comprises 1-95% by weight of the bottom effluent from the vacuum evaporation stage.

Claim 8 (Previously Presented): The process according to claim 7, wherein the first portion comprises 40-90% by weight of the bottom effluent from the vacuum evaporation stage.

Claim 9 (Previously Presented): The process according to claim 8, wherein the first portion comprises 60-85% by weight of the bottom effluent from the vacuum evaporation stage.

Claim 10 (Previously Presented): The process according to claim 2, wherein the first portion comprises 1-95% by weight of the bottom effluent from the film evaporator.

Claim 11 (Previously Presented): The process according to claim 10, wherein the first portion comprises 40-90% by weight of the bottom effluent from the film evaporator.

Claim 12 (Previously Presented): The process according to claim 11, wherein the first portion comprises 60-85% by weight of the bottom effluent from the film evaporator.

Claim 13 (Previously Presented): The process according to claim 3, wherein the first portion and the third portion together comprise 1-95% by weight of the bottom effluents from the film evaporator and the vacuum evaporation stage.

Claim 14 (Previously Presented): The process according to claim 13, wherein the first portion and the third portion together comprise 40-90% by weight of the bottom effluents from the film evaporator and the vacuum evaporation stage.

Claim 15 (Previously Presented): The process according to claim 14, wherein the first portion and the second portion together comprises 60-85% by weight of the bottom effluents from the film evaporator and the vacuum evaporation stage.

Claim 16 (Previously Presented): The process of claim 2, wherein the higher alcohol comprises at least one member selected from the group consisting of n-butanol, isobutanol, and 2-ethylhexanol.

Claim 17 (Previously Presented): The process of claim 3, wherein the higher alcohol comprises at least one member selected from the group consisting of n-butanol, isobutanol, and 2-ethylhexanol.

Claim 18 (Previously Presented): The process of claim 2, wherein the catalyst comprises a homogeneous catalyst.

Claim 19 (Previously Presented): The process of claim 3, wherein the catalyst comprises a homogeneous catalyst.

Claim 20 (Previously Presented): A process for continuously preparing higher (meth)acrylic esters (C) in a plant comprising a reaction apparatus and a vacuum evaporation stage for receiving a bottom product remaining after separation of a highly pure ester product, the process comprising:

transesterifying methyl(meth)acrylate (A) with a higher alcohol (B) in the presence of a catalyst or catalyst mixture in the reaction apparatus;

dividing a bottom effluent from the vacuum evaporation stage into a first portion and a second portion; and

recycling the first portion to the reaction apparatus;

wherein the first portion is recycled directly to the reaction apparatus.

Claim 21 (Previously Presented): A process for continuously preparing higher (meth)acrylic esters (C) in a plant comprising a reaction apparatus and a film evaporator for separating a highly pure ester product, the process comprising:

transesterifying methyl(meth)acrylate (A) with a higher alcohol (B) in the presence of a catalyst or catalyst mixture in the reaction apparatus;

dividing a bottom effluent from the film evaporator into a first portion and a second portion; and

recycling the first portion to the reaction apparatus;

wherein the first portion is recycled directly to the reaction apparatus.

Claim 22 (Previously Presented): A process for continuously preparing higher (meth)acrylic esters (C) in a plant comprising a reaction apparatus, a film evaporator for separating a highly pure ester product, and a vacuum evaporation stage for receiving a bottom product remaining after separation of a highly pure ester product, the process comprising:

transesterifying methyl(meth)acrylate (A) with a higher alcohol (B) in the presence of a catalyst or catalyst mixture in the reaction apparatus;

dividing a bottom effluent from the film evaporator into a first portion and a second portion;

recycling the first portion to the reaction apparatus;

dividing a bottom effluent of the vacuum evaporation stage into a third portion and a fourth portion; and

recycling the third portion to the reaction apparatus;

wherein:

the first portion is recycled directly to the reaction apparatus; and

the third portion is recycled directly to the reaction apparatus.

EVIDENCE APPENDIX

None.

RELATED PROCEEDINGS APPENDIX

None.